Measuring and Modeling the Speed of Sound and the Viscosity of N_2O and NO.

J.J. Hurly[C, S]

Chemical Science and Technology Laboratory, Process Measurements Division, National Institute of Standards and Technology, Gaithersburg, MD, U.S.A.

The speed of sound and the viscosity of nitrous oxide and nitric oxide have been accurately measured using advanced acoustic techniques [1-3]. The measurements span the temperature range 220 to 460 K, and pressures up to 3.3 MPa. In previous work, we fit speed-of-sound data with hard-core square-well and hard-core Lennard-Jones intermolecular potentials. The resulting virial equations of state are capable of predicting gas densities to better than 0.1 % at pressures up to 1.5 MPa. Here, we attempt to use these potentials and several other spherically symmetric intermolecular potentials to fit simultaneously the zero-density viscosities, $\eta_0(T)$ and the second acoustic virial coefficient $\beta_a(T)$. Our objective is to use model potentials to extrapolate $\eta_0(T)$ and $\beta_a(T)$ to much higher temperatures and to predict the thermal conductivity.

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